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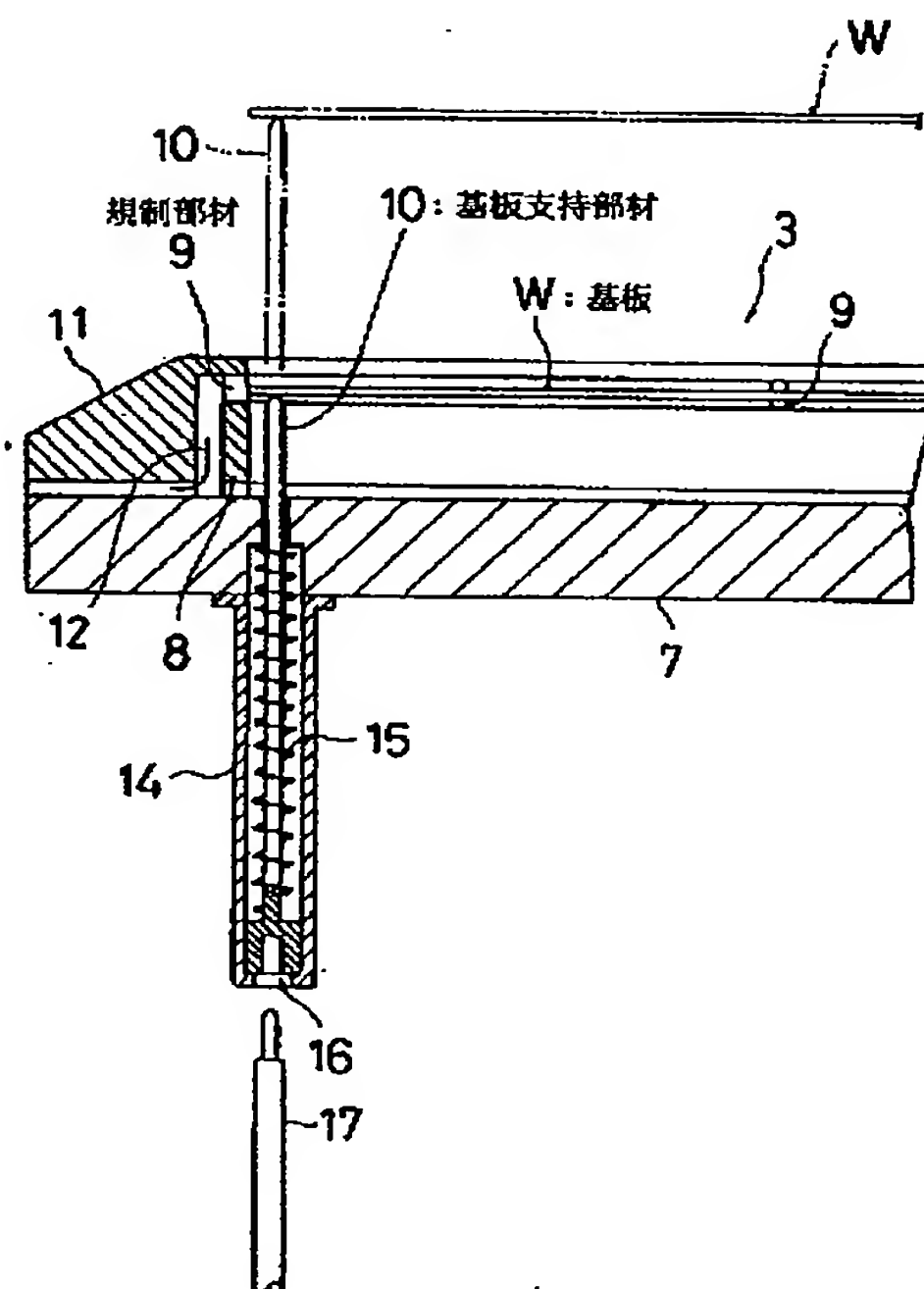
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(54) 【発明の名称】 回転式基板処理装置

(57) 【要約】

【目的】 基板裏面にチャック跡を生じさせないものでありながら、構成を簡単にできるとともに、基板の搬入・搬出のために基板を昇降する構成に起因する基板の裏面の汚れ発生を回避する。

【構成】 基板Wの裏面の外周縁側に点接触して基板Wを支持する基板支持部材10と、その基板支持部材10に支持された基板Wの外周端縁に点接触して基板Wの水平方向の位置を規制する規制部材9とによって基板Wの外周縁を保持させて鉛直方向の軸芯周りで回転可能に構成する。また、基板支持部材10自体を処理位置と受け渡し位置とに昇降し、基板搬送装置への受け渡しを行うように構成する。



【特許請求の範囲】

【請求項 1】 基板の外周縁を保持する基板保持手段と、その基板保持手段を鉛直方向の軸芯周りで回転する基板回転手段と、前記基板保持手段に保持された前記基板に処理液を供給する処理液供給手段とを備えた回転式基板処理装置であって、前記基板保持手段に、前記基板の裏面の外周縁側に点接触して前記基板を支持する基板支持部材と、前記基板支持部材に支持された前記基板の外周端縁に点接触して前記基板の水平方向の位置を規制する規制部材とを備え、少なくとも前記処理液供給手段からの処理液を供給する処理位置とそれより上方の受け渡し位置とに昇降可能に前記基板支持部材を設けるとともに、前記基板支持部材を昇降する昇降手段を設けたことを特徴とする回転式基板処理装置。

【請求項 2】 請求項 1 に記載の基板保持手段に基板を線接触状態で支持する環状支持体を備え、基板支持部材が、基板を前記基板支持部材に支持する第 1 の処理位置と、それよりやや下降して規制部材により水平方向の位置を規制する範囲内で前記基板を前記環状支持体に支持させる第 2 の処理位置とに昇降するものである回転式基板処理装置。

【請求項 3】 請求項 1 または請求項 2 に記載の基板保持手段に一体回転自在にエアシリンダを設け、前記エアシリンダと基板支持部材とを連動連結するとともに、前記エアシリンダのシリンダ室に、基板回転手段を構成する回転軸を通した空気流路を接続してある回転式基板処理装置。

【発明の詳細な説明】

【 0 0 0 1 】

【産業上の利用分野】 本発明は、半導体ウエハ、フォトマスク用のガラス基板、液晶表示装置用のガラス基板、光ディスク用の基板等の基板にレジスト液などの塗布液を塗布したり、また、基板の外周縁に溶剤を供給して洗浄する、いわゆるエッジリングを行うなどのために、基板の外周縁を保持する基板保持手段と、その基板保持手段を鉛直方向の軸芯周りで回転する基板回転手段と、基板の裏面に点接触して基板を基板保持手段に保持する保持位置とそれより上方の受け渡し位置とに昇降する基板昇降ピンとを備えた回転式基板処理装置に関する。

【 0 0 0 2 】

【従来の技術】 この種の回転式基板処理装置としては、従来一般に、基板を真空吸着によって保持するように構成されている。ところが、その強い吸着力に起因して基板裏面にチャック跡が残り、このチャック跡が前工程からの汚染に加わり、基板表面の高さにズレを生じて、露光時のフォーカス異常を発生させる問題があった。また、基板の裏面に付着したパーティクルが離脱し、カセットに收容する場合に、下側に收容されている基板の表面を汚染するとか、あるいは、基板搬送装置に転移して

他の基板を汚染するといった問題があった。

【 0 0 0 3 】 そこで、上述のような問題を回避するために、基板の外周縁側に、基板の裏面を支持する支持ピンと、基板の端縁と当接して水平方向の位置を規制する規制ピンとを設けるとか、あるいは、基板の外周縁をその全周にわたって覆いながら支持する環状部材を設けるなど、基板をその外周縁側でのみ支持するように構成したものが提案されている。

【 0 0 0 4 】 また、提案例の場合、基板の回転に伴って基板の裏面側で気流が発生し、その気流が基板の外周縁を支持する部材と干渉するとともに基板の外周部にまで乱流を引き起こす問題があり、通常、基板の裏面に対向するようにプレートなどを設け、そのプレートなどに、支持ピンや規制ピン、あるいは、環状部材を設け、基板との間に密閉状の空間が形成されるように構成されている。

【 0 0 0 5 】

【発明が解決しようとする課題】 しかしながら、基板をその外周縁側でのみ支持する構成の場合、基板を搬入・搬出するために基板を昇降する基板昇降ピンが必要である。そのため、プレートなどに、基板昇降ピンを出退する貫通穴を貫通形成し、所定位置に停止した状態で、貫通穴を通して基板昇降ピンを昇降させ、基板を昇降できるようにし、基板を回転して処理するときに、基板昇降ピンをプレートなどの下方に退避させているが、回転に伴う周囲の空気の流動に伴って基板昇降ピンにミストが付着し、その基板昇降ピンにより基板の裏面を再度汚染してしまう欠点があった。

【 0 0 0 6 】 本発明は、このような事情に鑑みてなされたものであって、請求項 1 に係る発明の回転式基板処理装置は、基板裏面にチャック跡を生じさせないものでありながら、構成を簡単にできるとともに、基板の搬入・搬出のために基板を昇降する構成に起因する基板の裏面の汚れ発生を回避できるようにすることを目的とし、また、請求項 2 に係る発明の回転式基板処理装置は、処理液による処理を基板裏面へのミストの回り込みの無い状態で良好に行うことができるようにすることを目的とし、また、請求項 3 に係る発明の回転式基板処理装置は、基板の処理位置と受け渡し位置とにわたる昇降を簡単な操作で行えるようにすることを目的とする。

【 0 0 0 7 】

【課題を解決するための手段】 請求項 1 に係る発明は、上述のような目的を達成するために、基板の外周縁を保持する基板保持手段と、その基板保持手段を鉛直方向の軸芯周りで回転する基板回転手段と、基板保持手段に保持された基板に処理液を供給する処理液供給手段とを備えた回転式基板処理装置において、基板保持手段に、基板の裏面の外周縁側に点接触して基板を支持する基板支持部材と、その基板支持部材に支持された基板の外周端縁に点接触して基板の水平方向の位置を規制する規制部

材とを備え、少なくとも処理液供給手段からの処理液を供給する処理位置とそれより上方の受け渡し位置とに昇降可能に基板支持部材を設けるとともに、基板支持部材を昇降する昇降手段を設けて構成する。

【0008】また、請求項2に係る発明の回転式基板処理装置は、上述のような目的を達成するために、請求項1に係る発明の回転式基板処理装置における基板保持手段に基板を線接触状態で支持する環状支持体を備え、基板支持部材を、基板を基板支持部材に支持する第1の処理位置と、それよりやや下降して規制部材により水平方向の位置を規制する範囲内で基板を環状支持体に支持させる第2の処理位置とに昇降するように構成する。

【0009】また、請求項3に係る発明の回転式基板処理装置は、上述のような目的を達成するために、請求項1または請求項2に係る発明の回転式基板処理装置における基板保持手段に一体回転自在にエアシリンダを設け、そのエアシリンダと基板支持部材とを連動連結するとともに、エアシリンダのシリンダ室に、基板回転手段を構成する回転軸を通した空気流路を接続して構成する。

【0010】

【作用】請求項1に係る発明の回転式基板処理装置の構成によれば、基板支持部材を基板の下面の外周縁側に点接触させ、そして、規制部材を基板の外周端縁に点接触させることにより、真空吸着によらずに基板を保持して回転させることができ、レジスト液の塗布などに際して、基板とわずかに接触するだけで基板を支持することができる。しかも、処理液を供給して処理する処理位置で基板を支持する基板支持部材そのものの昇降によって基板を受け渡し位置まで上昇することができる。

【0011】また、請求項2に係る発明の回転式基板処理装置の構成によれば、レジスト液の塗布などに際しては、基板支持部材を第2の処理位置に下降させ、基板を線接触状態で環状支持体に支持させて基板の下面側への処理液などのミストの回り込みを回避できる。一方、基板の上面の外周縁に対して洗浄液を供給して洗浄処理する場合などには、規制部材により基板の水平方向の位置を規制する範囲内で、基板を環状支持体に線接触させずに基板支持部材に点接触状態で支持させる第1の処理位置まで上昇させ、その状態で基板を保持して回転させることができる。更に、基板支持部材を受け渡し位置まで上昇することにより、基板を基板搬送装置との間で受け渡しすることができる。

【0012】また、請求項3に係る発明の回転式基板処理装置の構成によれば、基板支持部材を昇降するのに、基板支持部材を所定位置に停止させ、その停止状態で固定側部材に設けた昇降機構と係合させるように構成する場合に比べ、任意の位置で停止した状態で、あるいは、回転させたままでも基板昇降部材を昇降させることがで

きる。

【0013】

【実施例】次に、本発明の実施例を図面を用いて詳細に説明する。図1は本発明の回転式基板処理装置の実施例を示す全体概略縦断面図、図2は要部の平面図、図3は要部の斜視図であり、電動サーボモータ1の駆動によって鉛直方向の軸芯周りで回転する回転軸2の上端に、基板Wの外周縁を載置して保持する基板保持手段3が一体回転可能に取り付けられている。

10 【0014】基板保持手段3およびそれによって水平姿勢に保持された基板Wの周囲は、処理液の飛散を防止するためのカップ4で覆われている。

【0015】カップ4の外側には、基板W上の回転中心に相当する供給位置と基板W上から離れた待機位置にわたって移動可能に構成されたレジスト液供給ノズル5が設けられ、供給位置において基板Wの表面にレジスト液を供給し、基板Wの回転により基板Wの表面にレジスト液を塗布できるように構成されている。また、カップ4の外側には、基板Wの外周縁上に相当する供給位置と基板W上から離れた待機位置にわたって移動可能に構成された溶剤供給ノズル6が設けられ、供給位置において基板Wの表面の外周縁に溶剤を供給し、基板外周縁の不要なレジスト液を除去できるように構成されている。

20 【0016】基板保持手段3は、回転軸2に一体回転可能に連結される底板7に、図4の要部の拡大断面図に示すように、スペーサ（図示せず）を介して排水用の隙間（例えば、約0.2mm）が形成されるように円筒状の環状部材8を取り付けて構成されている。

【0017】環状部材8の上面には、その周方向に所定間隔を隔てて6本のピン状の規制部材9…が設けられ、基板Wの外周端縁に点接触して基板Wの水平方向の位置を規制するように構成されている。規制部材9…のうちの所定の2本は、基板Wのオリエンテーションフラットの

30 外周端縁に点接触して基板Wに回転力を有効に伝達できるように設けられている。規制部材9としては、ピン状に限らず、基板Wの外周端縁に点接触できるように構成するものであれば良く、棒状でも板状でも良い。

【0018】また、底板7の環状部材8の内周面に近い所定の3箇所に、基板Wの裏面の外周縁側に点接触して

40 基板Wを支持するピン状の基板支持部材10が昇降可能に設けられている。

【0019】前記規制部材9…の上端側ならびに水平方向外側において、基板Wの外周縁を全周にわたって覆うように環状体11が設けられ、かつ、基板Wの外周縁ならびに規制部材9…と環状体11の内周面との間、および、環状部材8の外周面と環状体11の内周面との間に、基板Wから遠心力によって流されるドレンを鉛直方向下方に向かわせるドレン流路12が形成されている。

【0020】環状体11の上面は平坦な水平面に構成され、また、環状体11の下部はスペーサ（図示せず）を

介してドレン排出用の隙間が形成されるように底板7に取り付けられ、ドレン流路12を通じて流されるレジスト液や溶剤を外部に排出できるように構成されている。また、ドレン流路12により、遠心力により基板Wの外周縁と環状体11の内周面との間側に向かう気流を環状体11の内周面で受け止め、その流れに抵抗を与え、気流のほとんどを乱れの無い状態で環状体11の平坦な上面に沿って流し、ピン状の基板支持部材10…や規制部材9…によって乱流が生じることを防止できるように構成されている。

【0021】回転軸2が筒状に構成され、その回転軸2内から底板7を貫通する状態で洗浄液供給ノズル13が設けられ、基板Wの裏面に洗浄液を供給し、排水用の隙間からドレン排出用の隙間を通じて外部に排出し、基板Wの裏面を洗浄できるように構成されている。

【0022】底板7の下向き面の所定の3箇所に下方に延びる筒体14が取り付けられ、その筒体14…それぞれ内に基板支持部材10の下方側が内嵌されるとともに、基板支持部材10を下降側に変位するように付勢する圧縮コイルスプリング15が設けられている。筒体14の下部に開口16が形成され、その開口16の下方に対応させて、基板支持部材10に当接して上昇させる押圧部材17が昇降可能に設けられるとともに押圧部材17にエアシリンダ18が連動連結されている。この押圧部材17とエアシリンダ18とから成る構成を昇降手段と称する。

【0023】上記構成により、基板Wの搬入時には、ロータリー・エンコーダなどにより所定位置で停止された基板保持手段3に対して押圧部材17を上昇させ、基板支持部材10に当接してそれを基板Wの受け渡し位置まで上昇させる。そして、基板Wの受け渡し後には、押圧部材17を筒体14外まで下降させて、基板支持部材10に対して非当接状態にし、圧縮コイルスプリング15の弾性復元力により基板支持部材10を下降させ、基板Wを処理位置に下降する。この状態で、基板Wを回転してレジスト液の塗布やエッジリンスや裏面洗浄処理を行う。このとき、基板支持部材10と筒体14との間で密閉状態に維持され、基板Wの昇降構成に起因して下部から空気を流入させることが無く、基板Wの裏面の汚染を発生しない。次いで、基板Wを搬出するときには、基板保持手段3の回転をロータリー・エンコーダなどにより所定位置で停止させ、基板保持手段3に対して押圧部材17を上昇させ、基板支持部材10に当接してそれに支持された基板Wを受け渡し位置まで上昇させて搬出する。

【0024】この第1実施例において、基板支持部材10を下降側に変位するように付勢するのに、上述のような圧縮コイルスプリング15に代えて、例えば、引っ張りスプリングを用いるとか、更に、基板支持部材10そのものを重量物で構成するとか、あるいは、基板支持部

材10に重量物を付設するなど、重力を利用しても良い。

【0025】図5は、本発明の回転式基板処理装置の第2実施例を示す全体概略縦断面図であり、第1実施例と異なるところは次の通りである。

【0026】すなわち、底板7に、上面を回転軸芯側ほど低くなる傾斜面Fに構成された環状支持体19が、スペーサ（図示せず）を介して排水用の隙間（例えば、約0.2mm）が形成されるように取り付けられている。環状支持体19の傾斜面Fに相当する箇所において、その周方向に所定間隔を隔てて3本の基板支持部材20…が、底板8および環状支持体19を貫通して昇降可能に設けられている。

【0027】図6の要部の拡大断面図に示すように、基板支持部材20…それぞれに対応させて、底板7の下面にストッパー部材21が取り付けられている。ストッパー部材21内には、圧縮コイルスプリング22によって付勢されたストッパーピン23が設けられ、一方、基板支持部材20…それぞれの上下方向に所定間隔を隔てた2箇所それぞれにストッパーピン23を嵌入する係止溝24、24が形成され、図6の（a）に示すように、基板支持部材20…の先端を基板Wの下面に近接したやや下方に位置させて基板Wを環状支持体19に支持させる第2の処理位置と、図6の（b）に示すように、環状支持体19から離間して、基板Wの外周端縁を規制部材9…に点接触して水平方向の位置を規制しながら基板支持部材20…に支持させる上方の第1の処理位置とにわたって基板Wを昇降するとともに、ストッパーピン23により基板支持部材20…をそれぞれの位置に維持するように構成されている。

【0028】基板支持部材20…は、図7の要部の平面図に破線で示すように、環状のロッド25によって一体連結されるとともに、図5に示すように、ロッド25の外側方に鏝部材26が一体的に設けられている。

【0029】図5に示すように、第1、第2および第3のエアシリンダ27、28、29に連動連結された昇降ロッド30の先端に、鏝部材26に係止する係止部材31が一体的に設けられている。他の構成は第1実施例と同じであり、同一図番を付してその説明は省略する。

【0030】次に、上記第2実施例の構成による作用につき、図8の概略側面図を用いて説明する。

【0031】①レジスト液塗布

まず、図8の（a）に示すように、第1、第2および第3のエアシリンダ27、28、29のいずれをも短縮させることにより、係止部材31を鏝部材26に係止しながら、基板支持部材20を最も下方に下降させ、ストッパーピン23により第2の処理位置に維持させる〔図6の（a）参照〕。この後、第1のエアシリンダ27だけを伸長し、係止部材31の鏝部材26に対する係止を解除しておく。これにより、基板Wの外周端縁を環状支持

体 1 9 に線接触させて支持させた状態で回転でき、ミストを基板 W の下面に回り込ませることなく基板 W の表面にレジスト液を供給して塗布できる。

【 0 0 3 2 】 ② エッジリンス (バックリンス)

上述処理の後に第 2 のエアシリンダ 2 8 を伸長させることにより、係止部材 3 1 を鏝部材 2 6 に係止しながら、基板支持部材 2 0 を上昇させ、規制部材 9 により水平方向の位置を規制する状態で基板支持部材 2 0 により基板 W を支持する第 1 の処理位置に基板 W を上昇し、ストッパピン 2 3 により第 1 の処理位置に維持させる [図 6 の (b) 参照] 。この後、図 8 の (b) に示すように、第 1 のエアシリンダ 2 7 を短縮し、係止部材 3 1 の鏝部材 2 6 に対する係止を解除しておく。これにより、基板 W の外周端縁を基板支持部材 2 0 に点接触させて支持させた状態で回転でき、基板 W の外周端縁に対する洗浄や裏面に対する洗浄を行うことができる。

【 0 0 3 3 】 ③ 基板受け渡し

上述の後に、図 8 の (c) に示すように、第 1 、第 2 および第 3 のエアシリンダ 2 7 、 2 8 、 2 9 のいずれをも伸長させることにより、係止部材 3 1 を鏝部材 2 6 に係止しながら、基板支持部材 2 0 を最も上方の受け渡し位置まで上昇させ [図 6 の (b) の二点鎖線参照] 、基板搬送装置によって基板 W を受け渡すことができる。

【 0 0 3 4 】 図 9 は、本発明の回転式基板処理装置の第 3 実施例を示す一部省略縦断面図、図 1 0 は平面図であり、第 2 実施例と異なるところは次の通りである。

【 0 0 3 5 】 すなわち、基板支持部材 3 2 …それぞれがリリースワイヤーで構成され、それぞれの他端側に第 4 および第 5 のエアシリンダ 3 3 、 3 4 が連動連結されるとともに、基板支持部材 3 2 を下降側に変位するように付勢する圧縮コイルスプリング 3 5 が介装されている。第 4 のエアシリンダ 3 3 の伸縮によって基板支持部材 3 2 を第 1 の処理位置と第 2 の処理位置とに昇降させ、一方、第 5 のエアシリンダ 3 4 の伸縮によって基板支持部材 3 2 を第 1 の処理位置と受け渡し位置とに昇降させるようになっている。

【 0 0 3 6 】 第 4 および第 5 のエアシリンダ 3 3 、 3 4 それぞれの加圧用のシリンダ室 (図示せず) に第 1 のエア配管 3 6 が接続されるとともに、その第 1 のエア配管 3 6 と、加圧空気源 (図示せず) に接続された第 2 のエア配管 3 7 とが、底板 7 の回転軸 2 との連結用筒部 7 a の肉厚内に形成した第 1 の空気流路 3 8 a 、回転軸 2 の肉厚内に形成した第 2 の空気流路 3 8 b 、および、固定部材 3 9 に取り付けた円筒体 4 0 に形成した環状空気流路 3 8 c を介して接続されている。他の構成は第 2 実施例と同じであり、同一図番を付してその説明は省略する。

【 0 0 3 7 】 この第 3 実施例の構成によれば、基板支持部材 3 2 …に対する第 1 の処理位置と第 2 の処理位置とへの昇降を、基板 W を任意の位置に停止した状態や基板

W を回転した状態のままで加圧空気を給排することにより容易に行うことができる利点を有している。

【 0 0 3 8 】 この第 3 実施例において、圧縮コイルスプリング 3 5 に代えて引っ張りスプリングを用いるとともに第 4 および第 5 のエアシリンダ 3 3 、 3 4 と真空吸引源とを接続し、真空吸引圧を用いて基板支持部材 3 2 …を昇降するように構成しても良い。

【 0 0 3 9 】 前述のレジスト液供給ノズル 5 、溶剤供給ノズル 6 および洗浄液供給ノズル 1 3 をして処理液供給手段と総称する。

【 0 0 4 0 】 本発明としては、上述実施例のようなオリエンテーションフラットを有する円形基板に限らず、ノッチを有する円形基板や液晶用などの角型基板に対する回転式基板処理装置にも適用できる。

【 0 0 4 1 】

【 発明の効果 】 以上の説明から明らかなように、請求項 1 に係る発明の回転式基板処理装置によれば、基板支持部材を基板の下面の外周縁側に点接触させ、そして、規制部材を基板の外周端縁に点接触させることにより、真空吸着によらずに基板を保持して回転させることができ、レジスト液の塗布などに際して、基板とわずかに接触するだけで基板を支持することができる。しかも、処理液を供給して処理する処理位置で基板を支持する基板支持部材そのものの昇降によって基板を受け渡し位置まで上昇するから、従来のように、基板を受け渡し位置まで昇降するための専用の基板支持ピンを不用にできるとともに、基板支持ピンとの接触に伴う基板裏面の再汚染を防止でき、基板裏面にチャック跡を生じさせないものでありながら、構成を簡単にできるとともに、基板の搬入・搬出のために基板を昇降する構成に起因する基板の裏面の汚れ発生を回避でき、基板の端面や裏面の清浄度を高くできて処理品質を向上できるようになった。

【 0 0 4 2 】 また、請求項 2 に係る発明の回転式基板処理装置によれば、レジスト液の塗布などに際しては、基板を線接触状態で環状支持体に支持させて基板の下面側への処理液などのミストの回り込みを回避できる。一方、基板の上面に対して洗浄液を供給して洗浄処理する場合などには、基板を環状支持体に線接触させずに基板支持部材に点接触状態で支持させる第 1 の処理位置まで上昇させた状態で基板を保持して回転させることができる。また、この第 1 の処理位置で、基板の上面の外周縁に洗浄液を供給すると、基板の下面側の外周縁は支持部材と接触していないので、基板の外周縁に向けた洗浄液が基板の下面側外周縁まで浸透し、基板の外周縁全体を洗浄することができるから、基板の外周縁を洗浄する場合に、洗浄処理を良好に行うことができるようになった。

【 0 0 4 3 】 また、請求項 3 に係る発明の回転式基板処理装置によれば、基板支持部材を昇降するのに、支持部材を所定位置に停止させ、その停止状態で固定側部材に

設けた昇降機構と連係させるように構成する場合に比べ、任意の位置で停止した状態で、あるいは、回転したままでも基板支持部材を昇降させることができるから、基板支持部材を所定位置に停止させることが不用になり、基板の処理位置と受け渡し位置とにわたる昇降を簡単な操作で行えるようになった。

【図面の簡単な説明】

【図1】本発明の回転式基板処理装置の第1実施例を示す全体概略縦断面図である。

【図2】要部の平面図である。

【図3】要部の斜視図である。

【図4】要部の拡大断面図である。

【図5】本発明の回転式基板処理装置の第2実施例を示す全体概略縦断面図である。

【図6】要部の拡大断面図である。

【図7】要部の平面図である。

【図8】作用説明に供する概略側面図である。

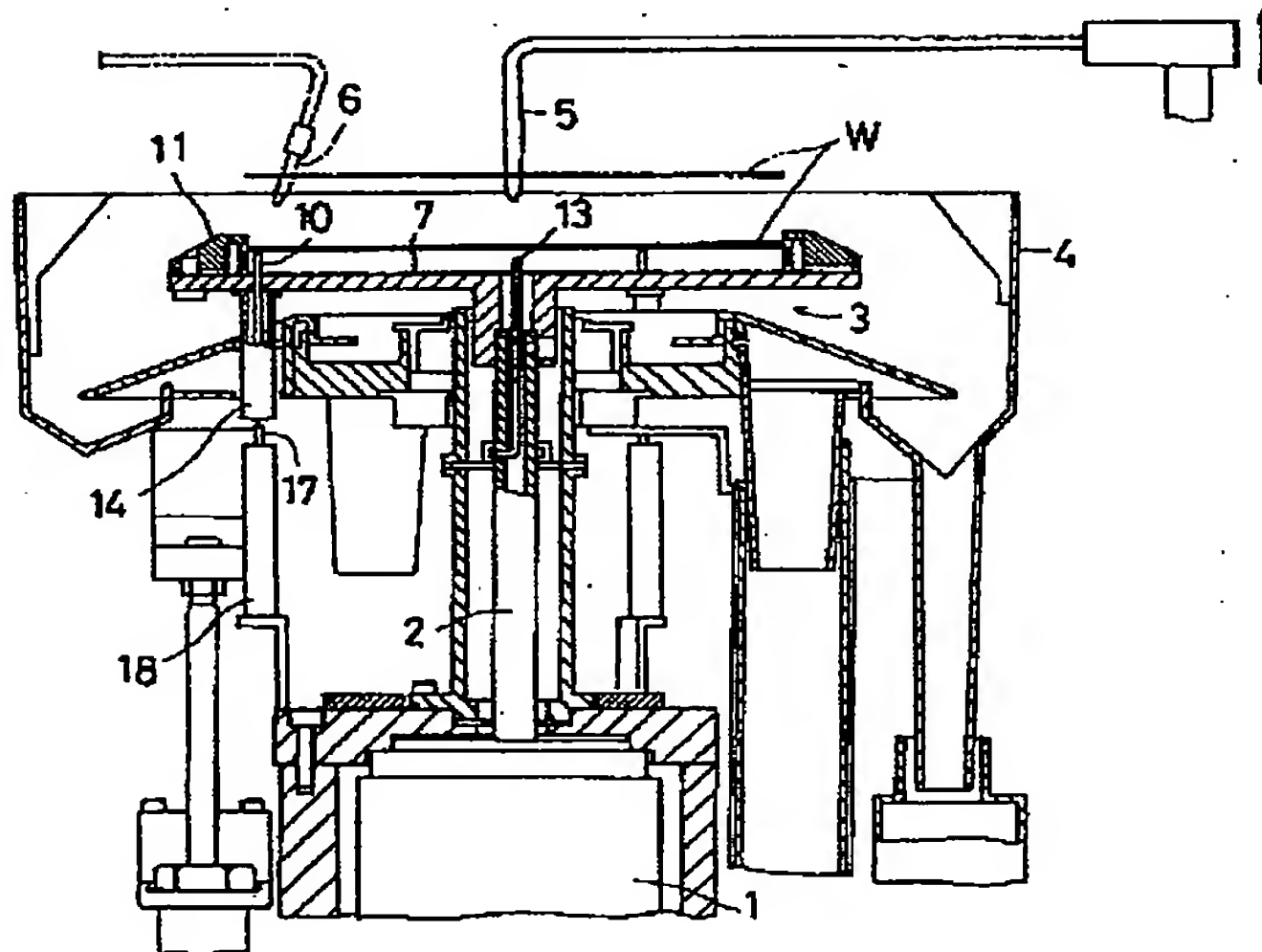
【図9】本発明の回転式基板処理装置の第3実施例を示す一部省略縦断面図である。

【図10】要部の平面図である。

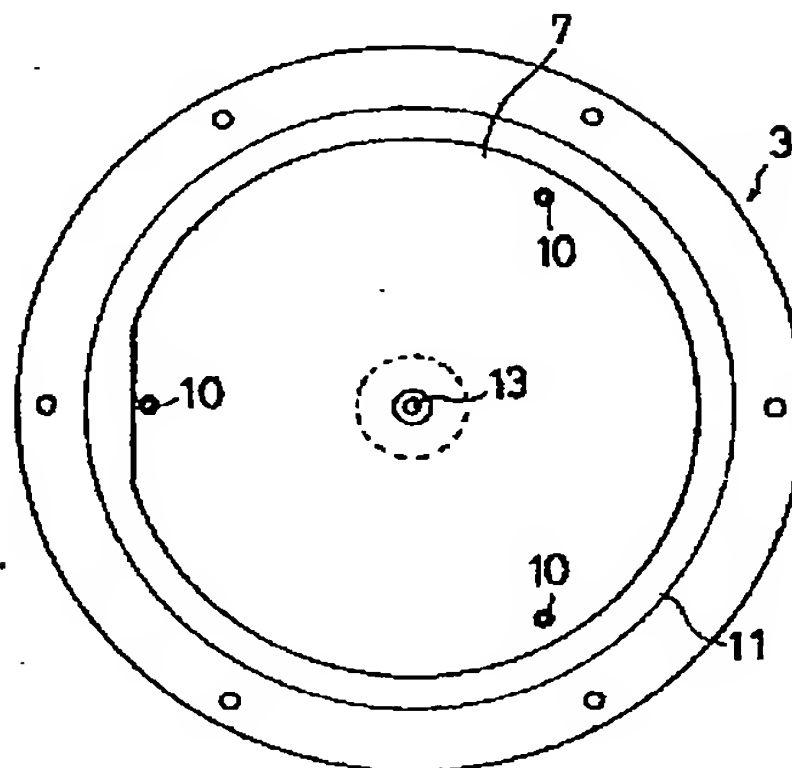
【符号の説明】

- 1…電動サーボモータ
- 2…回転軸
- 3…基板保持手段
- 5…レジスト液供給ノズル
- 6…溶剤供給ノズル
- 9…規制部材
- 10…基板支持部材
- 13…洗浄液供給ノズル
- 18…エアシリンダ
- 19…環状支持体
- 20…基板支持部材
- 32…基板支持部材
- 33…第4のエアシリンダ
- 34…第5のエアシリンダ
- 38b…第2の空気流路
- W…基板

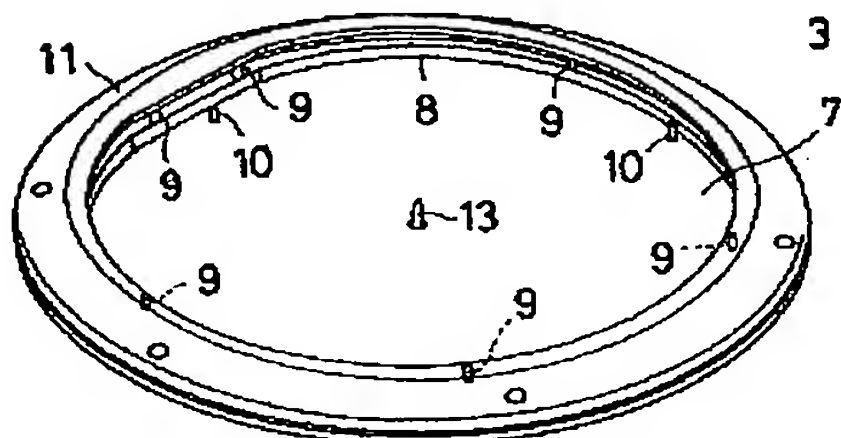
【図1】



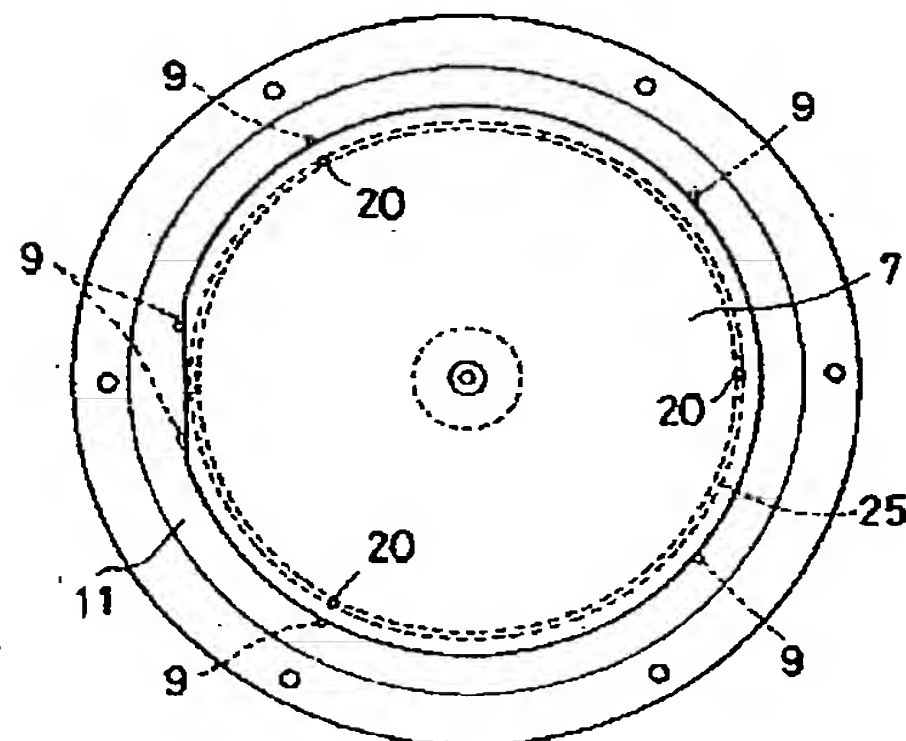
【図2】



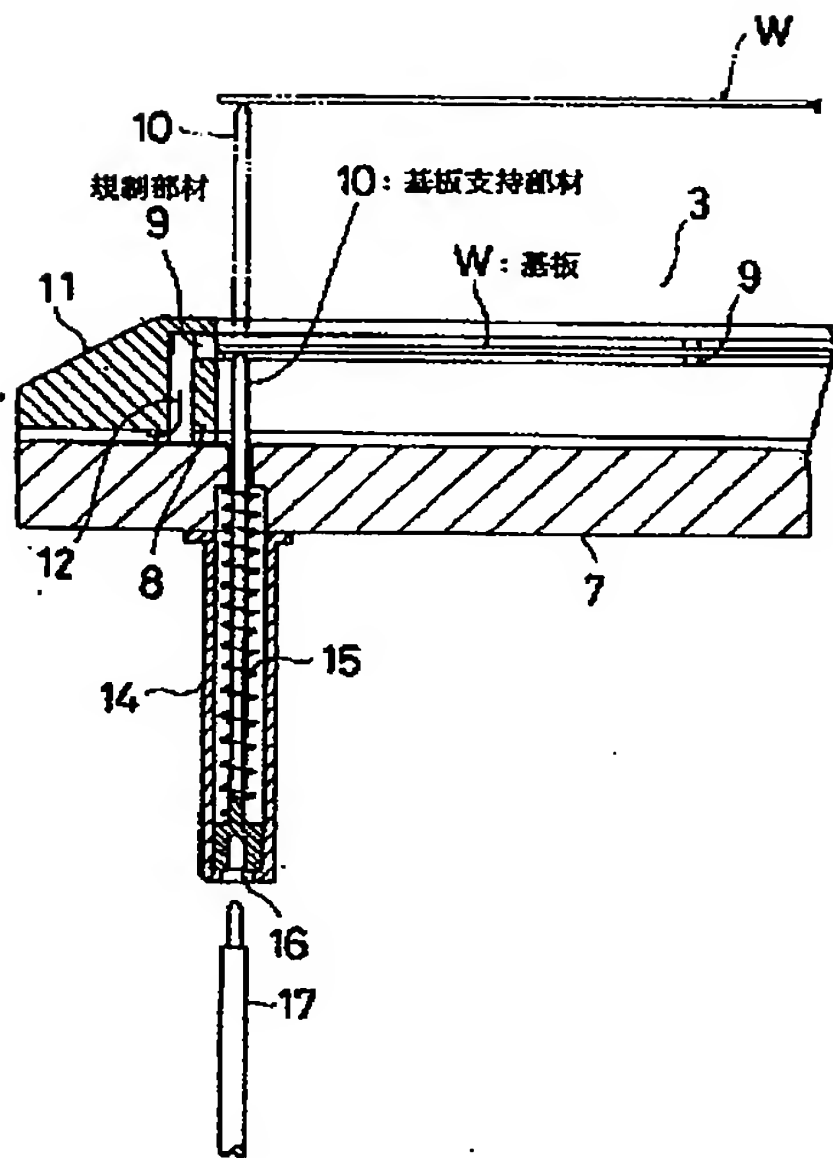
【図3】



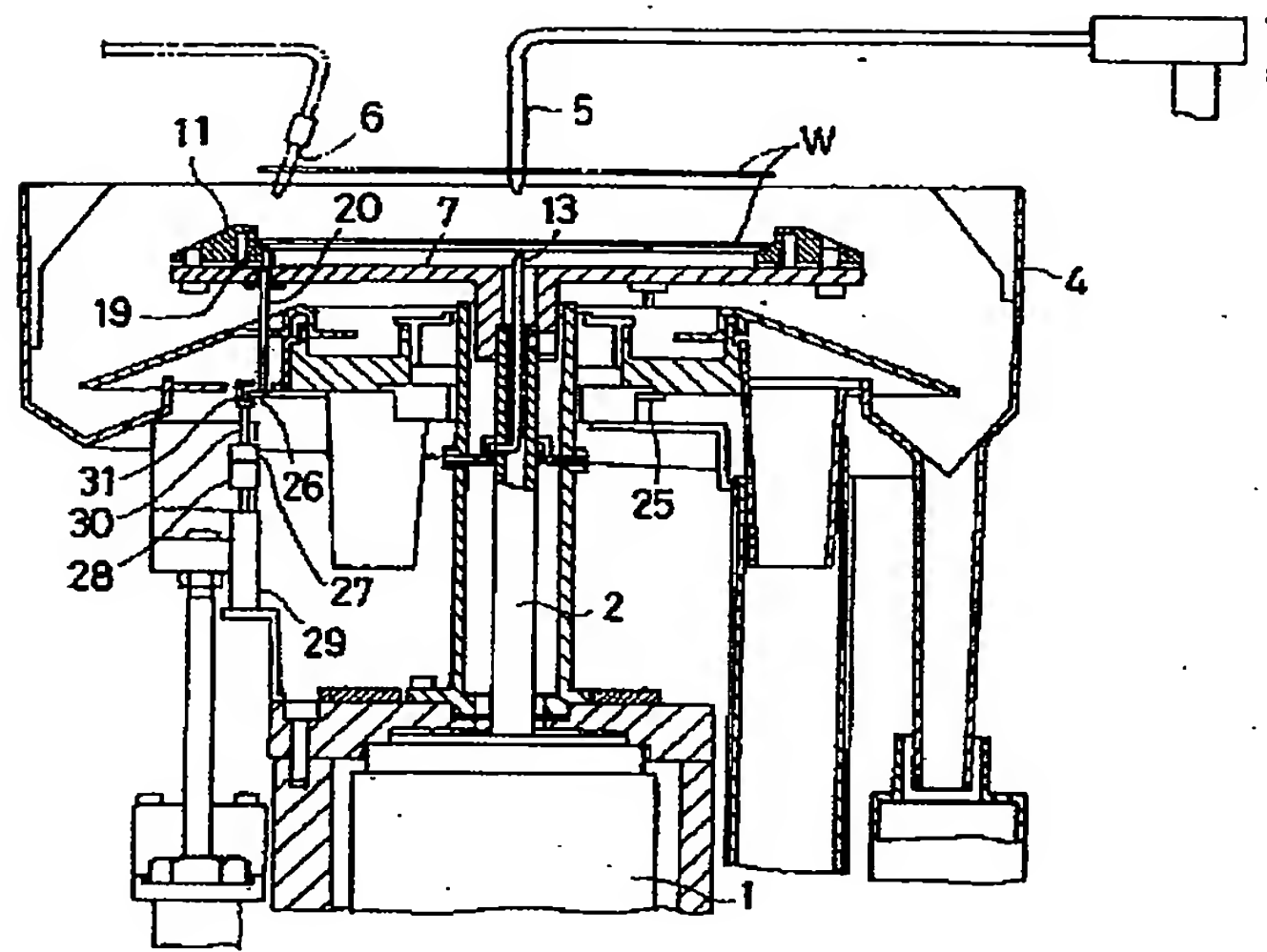
【図7】



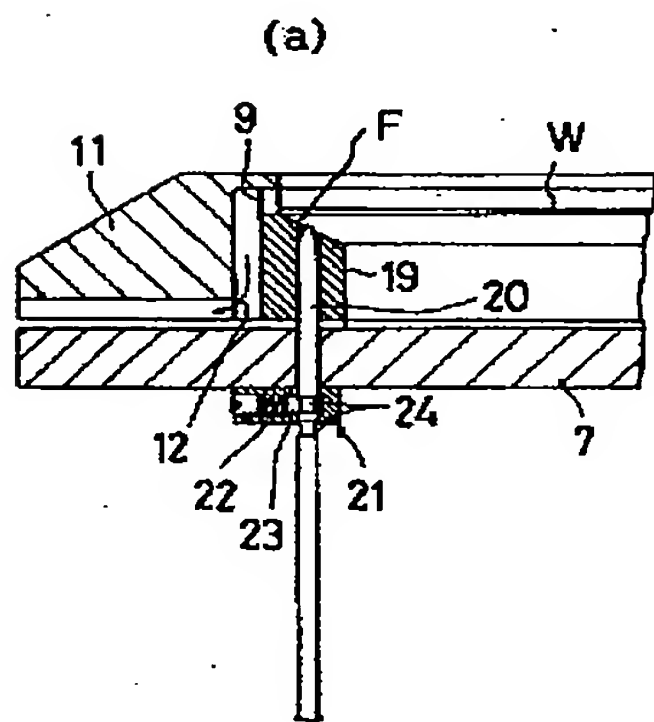
【図4】



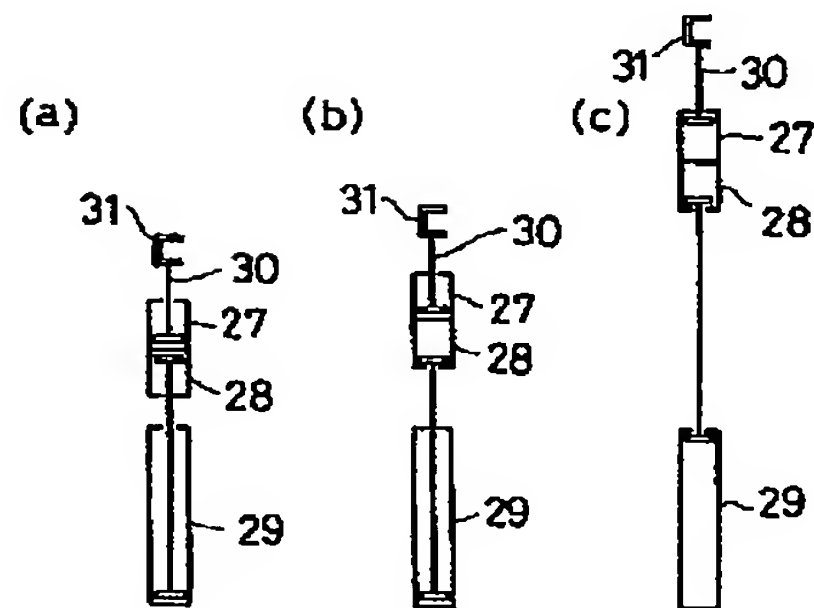
【図5】



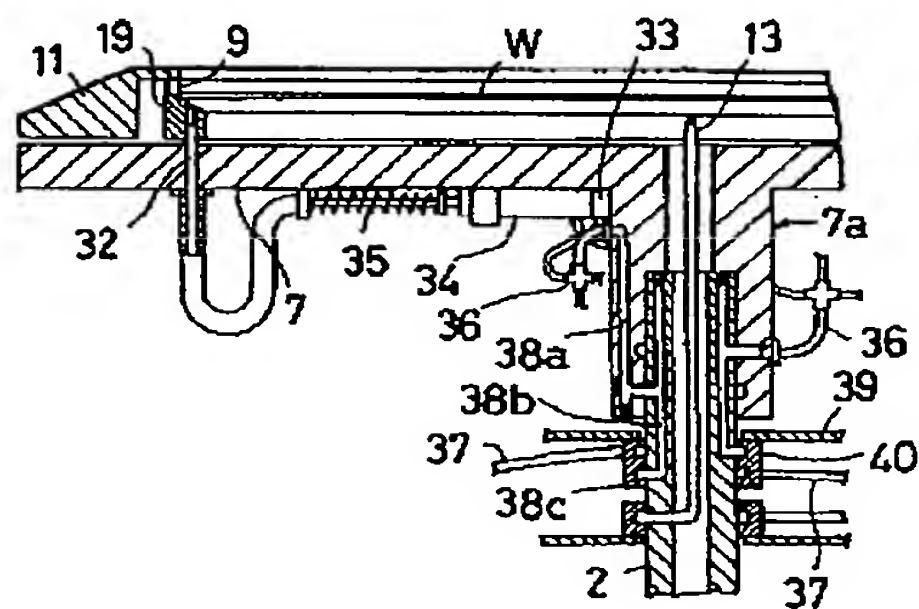
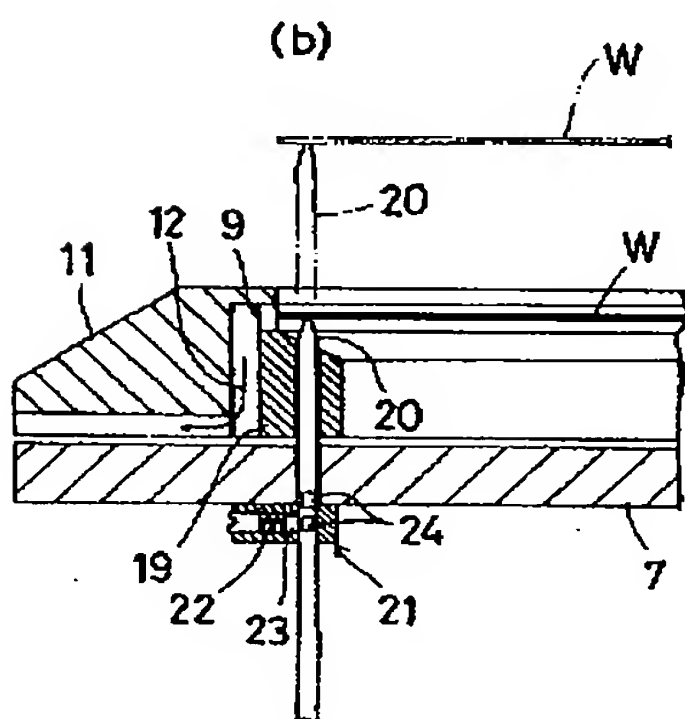
【図6】



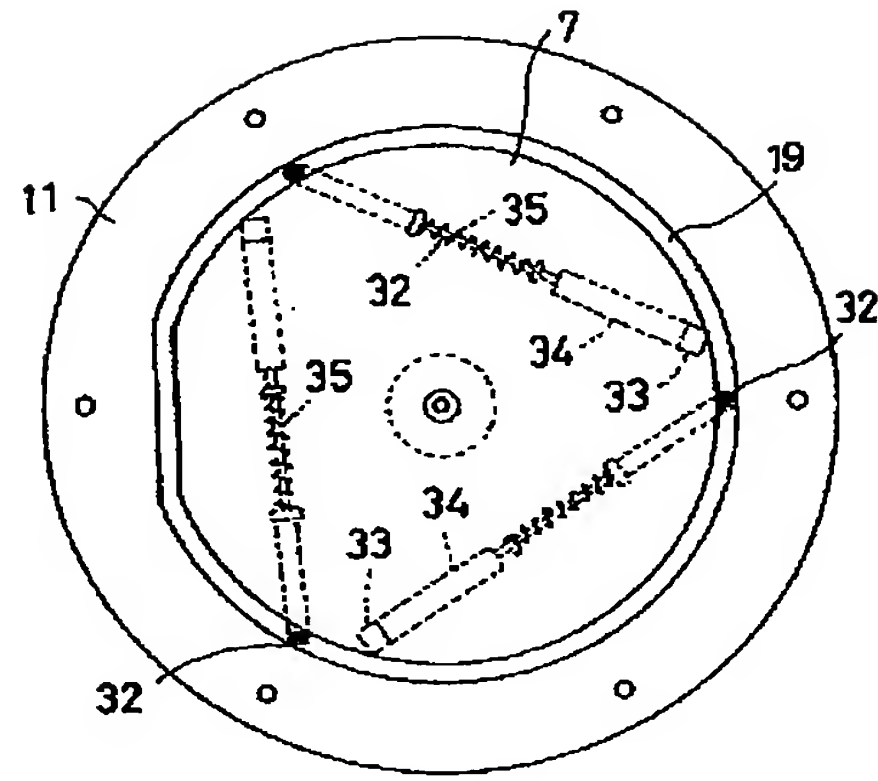
【図8】



【図9】



【図10】



PATENT ABSTRACTS OF JAPAN

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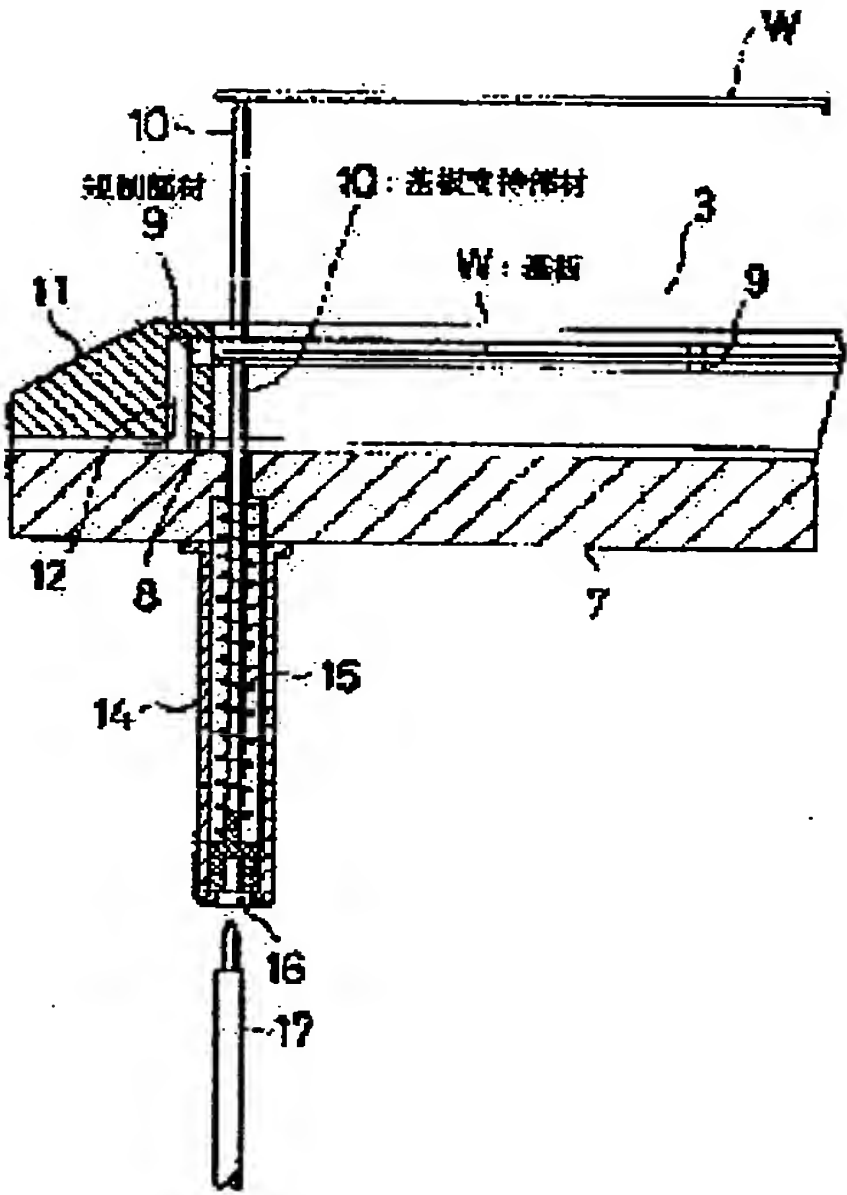
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H01L 21/68

(21)Application number : 07-039051 (71)Applicant : DAINIPPON SCREEN MFG CO LTD
(22)Date of filing : 02.02.1995 (72)Inventor : YABE MANABU

(54) ROTARY TYPE SUBSTRATE TREATING DEVICE

(57)Abstract:

PURPOSE: To make it possible to simplify constitution without generating the traces of chucking on the rear surface of a substrate and to avert the generation of stains of the rear surface of the substrate occurring in the constitution to vertically move the substrate for the purpose of carrying in and out of the substrate.
CONSTITUTION: The outer peripheral edge of the substrate W is held by a substrate supporting member 10 which supports the substrate W by coming into point contact with the outer peripheral edge side of the rear surface of the substrate W and a regulating member 9 which regulates the position in the horizontal direction of the substrate W by coming into point contact with the outer peripheral end edge of the substrate W supported at the substrate supporting member 10, by which the substrate is made rotatable around the axial center of a perpendicular direction. The treating device is thus so constituted that the substrate is made rotatable around the axial center in the perpendicular direction. The substrate supporting member 10 itself is vertically moved to a treating position and a transferring and receiving position, by which the substrate is transferred to and received from a substrate transporting device.



LEGAL STATUS

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Kind of final disposal of application other than the
examiner's decision of rejection or application
converted registration]
Date of final disposal for application]
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Date of registration] 23.08.2002
Number of appeal against examiner's decision of
rejection]
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of rejection]
Date of extinction of right]

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CLAIMS

Claim(s)]

Claim 1] A substrate maintenance means to hold the periphery edge of a substrate, and a substrate rotation means to rotate the substrate maintenance means by the circumference of the axis of the direction of a vertical, the substrate supporter material which is the rotating type substrate processor which equipped said substrate held at said substrate maintenance means with a processing liquid supply means to supply processing liquid, carries out point contact to the periphery veranda of the rear face of said substrate, and supports said substrate for said substrate maintenance means, It has the specification-part material which carries out point contact to the periphery edge of said substrate supported by said substrate supporter material, and regulates the horizontal location of said substrate. The rotating type substrate processor characterized by establishing a rise-and-fall means to go up and down said substrate supporter material while preparing said substrate supporter material in the processing location which supplies the processing liquid from said processing liquid supply means at least, and the delivery location of the upper part [it] possible [rise and fall].

Claim 2] The rotating-type substrate processor which is what goes up and down in the 2nd processing location which makes said annular base material support said substrate within the 1st processing location where a substrate maintenance means according to claim 1 is equipped with the annular base material which supports a substrate in the state of line contact, and substrate supporter material supports a substrate to said substrate supporter material, and limits which descend a little from it and regulate a horizontal location by specification-part material.

Claim 3] The rotating type substrate processor which has connected the airstream way which let the revolving shaft which constitutes a substrate rotation means in the cylinder room of said air cylinder pass while preparing the air cylinder in the substrate maintenance means according to claim 1 or 2 really free [rotation] and carrying out interlocking connection of said air cylinder and the substrate supporter material.

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DETAILED DESCRIPTION

Detailed Description of the [Invention]

0001]

[Industrial Application] This invention A semi-conductor wafer, the glass substrate for photo masks, the glass substrate for liquid crystal displays, For applying coating liquid, such as resist liquid, to substrates, such as a substrate for optical disks, and supplying a solvent on the periphery edge of a substrate, and washing, performing the so-called edge rinse, etc. A substrate maintenance means to hold the periphery edge of a substrate, and a substrate rotation means to rotate the substrate maintenance means by the circumference of the axis of the direction of a vertical, It is related with the rotating type substrate processor equipped with the substrate rise-and-fall pin which goes up and down in an upper delivery location from the maintenance location and it which carry out point contact to the rear face of a substrate, and hold a substrate for a substrate maintenance means.

0002]

[Description of the Prior Art] As this kind of a rotating type substrate processor, conventionally, generally, it is constituted so that a substrate may be held by vacuum adsorption. However, it originated in that strong adsorption power, and the remains of a chuck remained in the substrate rear face, these remains of a chuck caused contamination from the last process, produced gap in the height on the front face of a substrate, and there was a problem which generates the focal abnormalities at the time of exposure. Moreover, when the article adhering to the rear face of a substrate broke away and it held in a cassette, there was a problem of polluting the front face of the substrate held in the bottom, or having transferred to a substrate transport device and polluting other substrates.

0003] Then, what was constituted so that a substrate might be supported only on the periphery veranda is proposed, such as preparing the support pin which supports the rear face of a substrate, and the regulation pin which regulates a horizontal location in contact with the edge of a substrate in the periphery veranda of a substrate, or preparing the annular member supported while covering the periphery edge of a substrate over the perimeter, in order to avoid the above problems.

0004] Moreover, in the case of the example of a proposal, an air current occurs in the rear-face side of a substrate with rotation of a substrate. There is a problem which causes a turbulent flow even in the periphery section of a substrate while the air current interferes with the member which supports the periphery edge of a substrate. Usually, a plate etc. is prepared so that the rear face of a substrate may be countered, and a support pin, a regulation pin, or an annular member is prepared in the plate etc., and it is constituted so that the space of the letter of sealing may be formed between substrates.

0005]

[Problem(s) to be Solved by the Invention] However, in a configuration of supporting a substrate only on the periphery veranda, in order to carry in and take out a substrate, the substrate rise-and-fall pin which goes up and down a substrate is required. Therefore, although the substrate rise-and-fall pin is evacuated under the plate etc. when carry out penetration formation of the ***** which comes out of and removes a substrate rise-and-fall pin on a plate etc., make it go up and down a substrate rise-and-fall pin through a through hole, enabling it to go up and down a substrate in the condition of having stopped in the predetermined location and rotating and processing a substrate. Myst adhered to the substrate rise-and-fall pin with the flow of the air of the perimeter accompanying rotation, and there was a fault which pollutes the rear face of a substrate again by the substrate rise-and-fall pin.

0006] The rotating type substrate processor of invention which this invention is made in view of such a

tuation, and relates to claim 1 While being able to simplify a configuration, not making a substrate rear face produce the remains of a chuck The rotating type substrate processor of invention which relates to claim 2 for the purpose of enabling it to avoid dirt generating of the rear face of the substrate resulting from the configuration which goes up and down a substrate for carrying in and taking out of a substrate The rotating type substrate processor of invention which relates to claim 3 for the purpose of enabling it to perform processing with processing liquid good in the condition that there is no surroundings lump of Myst on the rear face of a substrate It aims at delivering with the processing location of a substrate and enabling it to perform the rise and fall covering a location by easy actuation.

[0007]

[Means for Solving the Problem] A substrate maintenance means to hold the periphery edge of a substrate in order that invention concerning claim 1 may attain the above purposes, In the rotating type substrate processor equipped with a substrate rotation means to rotate the substrate maintenance means by the circumference of the axis of the direction of a vertical, and a processing liquid supply means to supply processing liquid to the substrate held at the substrate maintenance means The substrate supporter material which carries out point contact to the periphery veranda of the rear face of a substrate, and supports a substrate for a substrate maintenance means, It has the specification-part material which carries out point contact to the periphery edge of the substrate supported by the substrate supporter material, and regulates the horizontal location of a substrate. A rise-and-fall means to go up and down substrate supporter material while preparing substrate supporter material in the processing location which supplies the processing liquid from a processing liquid supply means at least, and the delivery location of the upper part [it] possible [rise and fall] is established, and it constitutes.

[0008] Moreover, the rotating type substrate processor of invention concerning claim 2 The 1st processing location which equips the substrate maintenance means in the rotating type substrate processor of invention concerning claim 1 with the annular base material which supports a substrate in the state of line contact, and supports a substrate for substrate supporter material to substrate supporter material in order to attain the above purposes, It constitutes so that it may go up and down a substrate in the 2nd processing location which an annular base material is made to support within limits which descend a little and regulate a horizontal location by specification-part material from it.

[0009] Moreover, the rotating type substrate processor of invention concerning claim 3 connects and constitutes the airstream way through the revolving shaft which constitutes a substrate rotation means in the cylinder room of an air cylinder while it prepares an air cylinder in the substrate maintenance means in the rotating type substrate processor of invention concerning claim 1 or claim 2 really free [rotation] and carries out interlocking connection of the air cylinder and the substrate supporter material, in order to attain the above purposes.

[0010]

[Function] According to the configuration of the rotating type substrate processor of invention concerning claim 1, a substrate can be supported only by being able to hold and rotate a substrate, without being based on vacuum adsorption by carrying out point contact of the specification-part material to the periphery edge of a substrate, and contacting a substrate slightly on the occasion of spreading of resist liquid etc. by making the periphery veranda of the inferior surface of tongue of a substrate carry out point contact of the substrate supporter material. And by rise and fall of the substrate supporter material itself which supports a substrate, a substrate can be delivered and it can go up to a location in the processing location which supplies and processes processing liquid.

[0011] Moreover, according to the configuration of the rotating type substrate processor of invention concerning claim 2, drop substrate supporter material to the 2nd processing location, an annular base material is made to support a substrate in the state of line contact on the occasion of spreading of resist liquid etc., and a surroundings lump of Myst of the processing liquid by the side of the inferior surface of tongue of a substrate etc. can be avoided. On the other hand, in supplying a penetrant remover and carrying out washing processing to the periphery edge of the top face of a substrate It is made to go up within limits which regulate the horizontal location of a substrate by specification-part material to the 1st processing location which substrate supporter material is made to support in the state of point contact, without making an annular base material carry out line contact of the substrate. A substrate is held and rotated in the condition, a penetrant remover can be supplied to the periphery edge of the top face of a substrate, and washing processing can be carried out. Furthermore, a substrate can be delivered between substrate transport devices by delivering substrate supporter material and

going up to a location.

[012] Moreover, even freely made [it / according to the configuration of the rotating type substrate processor of invention concerning claim 3, / are in the condition which the predetermined location was made to stop substrate supporter material, and was stopped in the location of arbitration compared with the case where it constitutes so that it may be made to coordinate with the elevator style prepared in the fixed side member by the idle state, or / rotate, although it goes up and down substrate supporter material], you can make it go up and down a substrate rise-and-fall member.

[013]

[Example] Next, the example of this invention is explained to a detail using a drawing. A substrate maintenance means 3 for whole outline drawing of longitudinal section in which drawing 1 shows the example of the rotating type substrate processor of this invention, and drawing 2 to lay the periphery edge of Substrate W at the upper part of the revolving shaft 2 which the top view of an important section and drawing 3 are the perspective views of an important section, and rotates by the circumference of the axis of the direction of a vertical by the drive of the electric servo motor 1, and to hold is really attached pivotable.

[014] The perimeter of the substrate W held by the substrate maintenance means 3 and it at the horizontal position is covered from the cup 4 for preventing scattering of processing liquid.

[015] The resist liquid supply nozzle 5 constituted movable covering the supply location equivalent to the center of rotation on Substrate W and the position in readiness distant from on Substrate W is formed in the outside of a cup 4, and resist liquid is supplied to the front face of Substrate W in a supply location, and it is constituted so that resist liquid can be applied to the front face of Substrate W by rotation of Substrate W. Moreover, the solvent supply nozzle 6 constituted movable covering the supply location which corresponds on the periphery edge of Substrate W, and the position in readiness distant from on Substrate W is formed in the outside of a cup 4, and a solvent is supplied to the periphery edge of the front face of Substrate W in a supply location, and it is constituted so that resist liquid with an unnecessary substrate periphery edge can be removed.

[016] As shown in the expanded sectional view of the important section of drawing 4, the annular cylinder-like member 8 is attached and the substrate maintenance means 3 is constituted by the bottom plate 7 really connected with a revolving shaft 2 pivotable so that the clearance for wastewater (for example, about 0.2mm) may be formed through a spacer (not shown).

[017] Predetermined spacing is separated to the hoop direction, and six pin-like specification-part material 9 — is prepared in the top face of the annular member 8, and it is constituted so that point contact may be carried out to the periphery edge of Substrate W and the horizontal location of Substrate W may be regulated. Two of specification-part material 9 — predetermined are prepared so that point contact may be carried out to the periphery edge of the orientation flat of Substrate W and turning effort can be effectively transmitted to substrate W. It may be cylindrical or tabular is [that what is necessary is just what is constituted as specification-part material 9 so that point contact can be carried out to the periphery edge of not only the shape of a pin but the substrate W] sufficient.

[018] Moreover, the substrate supporter material 10 of the shape of a pin which carries out point contact to the periphery veranda of the rear face of Substrate W, and supports Substrate W to three near the inner skin of the annular member 8 of a bottom plate 7 predetermined is formed possible [rise and fall].

[019] Said specification-part material 9 — On an upper limit side and a horizontal outside, an annular solid 11 is formed so that the periphery edge of Substrate W may be covered over the perimeter. And the periphery edge of substrate W and specification-part material 9 —, and the drain passage 12 that makes the drain poured according to a centrifugal force from Substrate W between the inner skin of an annular solid 11 and between the peripheral face of the annular member 8 and the inner skin of an annular solid 11 go to the direction lower part of a vertical are formed.

[020] The top face of an annular solid 11 is constituted by the flat horizontal plane, and the lower part of an annular solid 11 is attached in a bottom plate 7 so that the clearance for drain discharge may be formed through a spacer (not shown), and it is constituted so that resist liquid and the solvent which are poured through the drain passage 12 can be discharged outside. Moreover, it responds to the air current which goes to a between the periphery edge of Substrate W, and the inner skin of an annular solid 11] side according to a centrifugal force by the inner skin of an annular solid 11 by the drain passage 12, and resistance is given to the flow, and it is constituted so that it can prevent substrate supporter material 10 — of the shape of a sink and a pin, and that a turbulent flow arises by specification-part material 9 — along the flat top face of an annular solid 11 in

he condition that there is no turbulence of most air currents.

[0021] A revolving shaft 2 is constituted by tubed, the penetrant remover supply nozzle 13 is formed in the condition of penetrating a bottom plate 7 from the inside of the revolving shaft 2, a penetrant remover is supplied to the rear face of Substrate W, and it discharges outside through the clearance for drain discharge from the clearance for wastewater, and it is constituted so that the rear face of Substrate W can be washed.

[0022] The barrel 14 prolonged caudad is attached in three predetermined places of the downward field of a bottom plate 7, and it is the barrel 14. — While inner fitting of the lower part side of the substrate supporter material 10 is carried out inside, respectively, the compression coil spring 15 energized so that the substrate supporter material 10 may be displaced to a descent side is formed. Opening 16 is formed in the lower part of a barrel 14, and it is made to correspond under the opening 16, and while the press member 17 raised in contact with the substrate supporter material 10 is formed possible [rise and fall], interlocking connection of the air cylinder 18 is carried out at the press member 17. The configuration which consists of this press member 17 and air cylinder 18 is called a rise-and-fall means.

[0023] By the above-mentioned configuration, at the time of carrying in of Substrate W, the press member 17 is raised to the substrate maintenance means 3 stopped by the rotary encoder etc. in the predetermined location, and it is raised to the delivery location of Substrate W in contact with the substrate supporter material 10. And after delivery of Substrate W, the press member 17 is dropped besides a barrel 14, it changes into the condition of not contacting, to the substrate supporter material 10, the substrate supporter material 10 is dropped according to the elastic stability of the compression coil spring 15, and Substrate W is descended to a processing location. In this condition, Substrate W is rotated and spreading and edge rinse of resist liquid, and rear-face washing processing are performed. At this time, it is maintained by the sealing condition between the substrate supporter material 10 and a barrel 14, originate in the rise-and-fall configuration of Substrate W, air is not made to flow from the lower part, and contamination of the rear face of Substrate W is not generated. Subsequently, when taking out Substrate W, stop rotation of the substrate maintenance means 3 by a rotary encoder etc. in a predetermined location, and raise the press member 17 to the substrate maintenance means 3, and deliver the substrate W supported by it in contact with the substrate supporter material 10, and it is made to go up to a location, and takes out.

[0024] In this 1st example, although it energizes so that the substrate supporter material 10 may be displaced to a descent side, gravity may be used, such as replacing with the above compression coil springs 15, for example, constituting substrate supporter material 10 themselves from a heavy lift further, or attaching a heavy lift at the substrate supporter material 10, using a hauling spring.

[0025] Drawing 5 is whole outline drawing of longitudinal section showing the 2nd example of the rotating type substrate processor of this invention, and a different place from the 1st example is as follows.

[0026] That is, the annular base material 19 constituted in the top face in the inclined plane F where a revolving-shaft heart side becomes low is attached in the bottom plate 7 so that the clearance for wastewater (for example, abbreviation 0.2mm) may be formed through a spacer (not shown). In the part equivalent to the inclined plane F of the annular base material 19, predetermined spacing is separated, and three substrates supporter material 20 — penetrates a bottom plate 8 and the annular base material 19 to the hoop direction, and is prepared in it possible [rise and fall].

[0027] As shown in the expanded sectional view of the important section of drawing 6, it is the substrate supporter material 20. — It is made to correspond to each and the stopper member 21 is attached in the inferior surface of tongue of a bottom plate 7. In the stopper member 21, the stopper pin 23 energized by the compression coil spring 22 is formed. On the other hand, it is the substrate supporter material 20. — As the stop slots 24 and 24 which insert the stopper pin 23 in each two which separated predetermined spacing place are formed in each vertical direction and it is shown in (a) of drawing 6 As it is indicated in (b) of drawing 6 as the 2nd [of substrate supporter material 20 — / which approached the inferior surface of tongue of Substrate W in the tip] processing location which makes it located a little caudad and makes the annular base material 19 support Substrate W Estrange from the annular base material 19, and while going up and down Substrate W covering the 1st upper processing location which substrate supporter material 20 — is made to support to specification-part material 9 —, carrying out point contact and regulating a horizontal location, the periphery edge of Substrate W It is constituted so that substrate supporter material 20 — may be maintained in each location by the stopper pin 23.

[0028] As a broken line shows to the top view of the important section of drawing 7, while substrate supporter material 20 — is really connected with the annular rod 25, as shown in drawing 5, the flange member 26 is

formed in the method of an outside of a rod 25 in one.

029] As shown in drawing 5, the stop member 31 which stops to a flange member 26 is formed at the tip of the rise-and-fall rod 30 by which interlocking connection was carried out in one at the 1st, 2nd, and 3rd air cylinders 27, 28, and 29. Other configurations are the same as the 1st example, the same drawing number is attached and the explanation is omitted.

030] Next, it explains about the operation by the configuration of the 2nd example of the above using the outline side elevation of drawing 8.

031] ** Stopping the stop member 31 to a flange member 26 by shortening all of the 1st, 2nd, and 3rd air cylinders 27, 28, and 29, as shown in (a) of resist liquid spreading place ** and drawing 8, drop the substrate supporter material 20 caudad and maintain the 2nd processing location by the stopper pin 23 [refer to (a) of drawing 6]. Then, only the 1st air cylinder 27 is elongated and the stop to the flange member 26 of the stop member 31 is canceled. It can rotate in the condition of having made the annular base material 19 carrying out the contact, and having made the periphery edge of Substrate W supporting by this, and resist liquid can be applied and applied to the front face of Substrate W, without rotating Myst on the inferior surface of tongue of substrate W.

032] ** Edge rinse (back side rinse)

Stopping the stop member 31 to a flange member 26 by expanding the 2nd air cylinder 28 after the above-mentioned processing The substrate supporter material 20 is raised, it goes up in the 1st processing location which supports Substrate W by the substrate supporter material 20 in the condition of regulating a horizontal position by the specification-part material 9, and it is made to maintain Substrate W in the 1st processing location by the stopper pin 23 [refer to (b) of drawing 6]. Then, as shown in (b) of drawing 8, the 1st air cylinder 27 is shortened and the stop to the flange member 26 of the stop member 31 is canceled. It can rotate in the condition of having carried out point contact of the periphery edge of Substrate W to the substrate supporter material 20, and having made it supporting by this, and washing to the periphery edge of Substrate W and washing to a rear face can be performed.

033] ** After a substrate delivery ****, stopping the stop member 31 to a flange member 26 by expanding all of the 1st, 2nd, and 3rd air cylinders 27, 28, and 29, as shown in (c) of drawing 8, the substrate supporter material 20 is raised to a most upper delivery location, and Substrate W can be delivered by [drawing 6 refers to (b)] the two-dot chain line], and the substrate transport device.

034] Abbreviation drawing of longitudinal section and drawing 10 are top views in part, and a different place from the 2nd example where drawing 9 shows the 3rd example of the rotating type substrate processor of this invention is as follows.

035] Namely, substrate supporter material 32 — While each consists of release wires and interlocking connection of the 4th and 5th air cylinders 33 and 34 is carried out at each other end side, the compression coil spring 35 energized so that the substrate supporter material 32 may be displaced to a descent side is infixed. The 1st processing location and the 2nd processing location are made to go up and down the substrate supporter material 32 by telescopic motion of the 4th air cylinder 33, on the other hand, the substrate supporter material 32 is delivered with the 1st processing location, and a location is made to go up and down by telescopic motion of the 5th air cylinder 34.

036] the 4th and 5th air cylinders 33 and 34, while the 1st Air piping 36 is connected to the cylinder room for each pressurization (not shown) The 1st Air piping 36 and the 2nd Air piping 37 connected to the pressurization air supply (not shown) It connects through 1st airstream way 38a formed in the thickness of cylinder part 7a for connection with the revolving shaft 2 of a bottom plate 7, 2nd airstream way 38b formed in the thickness of a revolving shaft 2, and annular airstream way 38c formed in the cylinder object 40 attached in the holddown member 39. Other configurations are the same as the 2nd example, the same drawing number is attached and the explanation is omitted.

037] According to the configuration of this 3rd example, it has the advantage which can be performed easily by carrying out the feeding and discarding of the pressurization air with the condition of having rotated the condition of having suspended Substrate W for the rise and fall to the 1st [to substrate supporter material 32 —] processing location, and the 2nd processing location in the location of arbitration, and Substrate W.

038] In this 3rd example, while replacing with the compression coil spring 35, pulling and using a spring, the 4th and 5th air cylinders 33 and 34 and sources of vacuum suction may be connected, and you may constitute so that it may go up and down substrate supporter material 32 — using vacuum suction force.

039] The resist liquid supply nozzle 5, the above-mentioned solvent supply nozzle 6, and the above-mentioned

penetrant remover supply nozzle 13 are carried out, and it is named a processing liquid supply means generically.

[0040] It is applicable not only to the circular substrate which has an orientation flat like the above-mentioned example as this invention but the rotating type substrate processor to square shape substrates, such as for which have a notch / a circular substrate, for liquid crystal, etc.].

[0041]

[Effect of the Invention] According to the rotating type substrate processor of invention concerning claim 1, so that clearly from the above explanation By carrying out point contact of the specification-part material to the periphery edge of a substrate by making the periphery veranda of the inferior surface of tongue of a substrate carry out point contact of the substrate supporter material A substrate can be held and rotated, without being based on vacuum adsorption, and a substrate can be supported only by contacting a substrate slightly on the occasion of spreading of resist liquid etc. Since a substrate is delivered and it goes up to a location by rise and fall of the substrate supporter material itself which supports a substrate in the processing location which supplies and processes processing liquid, and like before While being able to make unnecessary the substrate support pin of the dedication for delivering a substrate and going up and down to a location While being able to simplify a configuration, being able to prevent resoiling on the rear face of a substrate accompanying contact at substrate support pin, and not making a substrate rear face produce the remains of a chuck Dirt generating of the rear face of the substrate resulting from the configuration which goes up and down a substrate for carrying in and taking out of a substrate can be avoided, cleanliness of the end face of a substrate or a rear face can be made high, and processing quality can be improved now.

[0042] Moreover, according to the rotating type substrate processor of invention concerning claim 2, on the occasion of spreading of resist liquid etc., an annular base material is made to support a substrate in the state of line contact, and a surroundings lump of resist of the processing liquid by the side of the inferior surface of tongue of a substrate etc. can be avoided. On the other hand, when supplying a penetrant remover and carrying out washing processing to the top face of a substrate, substrate supporter material can be made to hold and rotate a substrate in the condition of having made it going up to the 1st processing location made supporting in the state of point contact, without making an annular base material carry out line contact of the substrate. Moreover, if a penetrant remover is supplied to the periphery edge of the top face of a substrate in this 1st processing location, since the periphery edge by the side of the inferior surface of tongue of a substrate will not touch supporter material Since the penetrant remover towards the periphery edge of a substrate permeated to the inferior-surface-of-tongue side periphery edge of a substrate and washed the whole periphery edge of a substrate, when the periphery edge of a substrate was washed, washing processing could be performed good.

[0043] Moreover, according to the rotating type substrate processor of invention concerning claim 3, although it goes up and down substrate supporter material In the condition of having made the predetermined location stopping supporter material and having stopped in the location of arbitration compared with the case where it constitutes so that it may be made to coordinate with the elevator style prepared in the fixed side member by the idle state Or since you made it go up and down substrate supporter material rotate, it became unnecessary to make a predetermined location stop substrate supporter material, it delivers with the processing location of a substrate and the rise and fall covering a location could be performed by easy actuation.

[Translation done.]

NOTICES *

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**** shows the word which can not be translated.

In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

Brief Description of the Drawings]

Drawing 1] It is whole outline drawing of longitudinal section showing the 1st example of the rotating type substrate processor of this invention.

Drawing 2] It is the top view of an important section.

Drawing 3] It is the perspective view of an important section.

Drawing 4] It is the expanded sectional view of an important section.

Drawing 5] It is whole outline drawing of longitudinal section showing the 2nd example of the rotating type substrate processor of this invention.

Drawing 6] It is the expanded sectional view of an important section.

Drawing 7] It is the top view of an important section.

Drawing 8] It is the outline side elevation with which operation explanation is presented.

Drawing 9] the 3rd example of the rotating type substrate processor of this invention is shown — it is abbreviation drawing of longitudinal section a part.

Drawing 10] It is the top view of an important section.

Description of Notations]

— Electric servo motor

— Revolving shaft

— Substrate maintenance means

— Resist liquid supply nozzle

— Solvent supply nozzle

— Specification-part material

) — Substrate supporter material

} — Penetrant remover supply nozzle

} — Air cylinder

) — Annular base material

) — Substrate supporter material

! — Substrate supporter material

} — The 4th air cylinder

! — The 5th air cylinder

lb — 2nd airstream way

— Substrate

translation done.]